



Slings Rigging

When “riggers” do not know the proper sling rigging methods, reductions due to angles and multiple points and sling attachment areas critical failures in operations are certain.

1. Lack of knowledge – not knowing the method used to attach a single-leg sling to a load can significantly affect the sling’s lifting capacity. Only a qualified person competent in rigging should determine the proper method to attach a sling to a load, based on the sling manufacturer’s data and instructions.
2. Not informing or training others – the way that a sling is attached to a load can significantly affect its lifting capacity. It is important to follow instructions for proper rigging techniques as specified by a qualified person, including utilizing the proper attachment methods to ensure that the load is lifted safely.

EXAMPLES OF INCIDENTS INVESTIGATED BY OSHA INCLUDE:

1. Report - May 2022: Investigation of the November 8, 2021, Partial Collapse of Wood Roof Trusses during Construction of Dollar General Store, Orange City, Florida. Wood roof trusses collapsed during installation and fell onto the ground floor where a Dollar General store was under construction when the rigging failed during installation of the subsequent truss. The roof framing consisted of 66 wood piggyback base trusses spanning 70 feet. Two employees were injured after falling approximately 12 feet, and a third employee cutting lumber inside the building was fatally crushed by the falling trusses.
2. Report - December 2021: Investigation of April 14, 2021, Collapse of a Bridge Span under Demolition, Herbert C. Bonner Bridge, Dare County, NC. The last span of the Herbert C. Bonner Bridge (Bonner Bridge) under demolition collapsed in Dare County, North Carolina. An employee engaged in the steel cutting was killed.. Improper support and rigging were the root causes.
3. Report - In New York, in 2015, a crane spontaneously dropped a 13-ton air conditioning unit from height. An unnamed inside source told reporters that the

sling holding the unit looked like something had cut through it. Ten people inside the building were injured, two of them construction workers. These injuries probably could have been prevented if the sling had been properly padded and if correct slings and rigging procedures were followed.

GENERAL: GUIDELINES

To ensure all loads are carefully and properly rigged before any lifting procedure is performed, every rigger should adhere to the following five rules for safe rigging.

1. Must be Trained, Qualified, and Experienced to do the Specific Type Lift.
2. Make Sure the Correct Rigging Method is Utilized for the Material Being Hoisted.
3. Make Sure that all Loads are Securely Attached.
4. Monitor and Test all Lifts and all Loads to Maintain a Level and Plumb Position in Flight.
5. Always Have a Qualified Spotter on Site and that Control Access Zones are Established and Controlled.

CODES:

OSHA Standard Subpart CC – 29 CFR 1926.1401 defines a “qualified rigger” as [A] rigger who meets the criteria for a qualified person. [B] a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.

The level of experience, knowledge, and skill needed to perform a rigging job safely depends on the type of rigging and the worksite conditions. The employer must ensure that the rigger has the ability to recognize and resolve any issues relating to the specific rigging work to be performed.

The crane standard does not require or refer to third-party evaluators with respect to qualified riggers as it does signal persons. The standard’s provisions regarding riggers differ in this respect from those

regarding signal persons, to which it refers, under which documentation from a “qualified evaluator (third party)” is an alternative means of compliance. For riggers, the employer may consider determinations made by a third party, such as a joint apprenticeship program, but it retains the employer’s responsibility for ensuring that any employee assigned to rig a load is qualified.

WHAT YOU NEED TO KNOW:

Always determine not only the weight and size of the load to be lifted by the methods applied as outlined below and assure that individuals doing the rigging have done so.

TYPE OF METHOD

- **Vertical (or Straight) Hitch:** A vertical or straight hitch is described by federal OSHA as a method of supporting a load by a single, vertical leg of the sling. In this configuration, the lifting eye on one end of the single-leg sling (such as wire rope, webbing, or chain) is attached directly to the lifting hook on the crane, hoist, or other lifting mechanism, and the other end to the load via an appropriately sized connection device such as a hook or lifting eye and clevis. One pitfall of this method is that a single connection point won’t stabilize the load, allowing it to teeter side to side.
- **Choker Hitch:** A choker hitch is described by federal OSHA as a sling configuration with one end of the sling passing under the load and then back through an end attachment, loop, or eye on the other end of the sling, forming a “choke” around the load. Then, the lifting eye on the free end of the sling is attached directly to the hook on the hoist or other lifting device. This choker method of rigging results in a lower lifting capacity (approximately 35 percent) than a vertical (straight pull) connection for the same size sling (see chart). However, a choker hitch is able to stabilize the load and provide more support as long as it is tightened properly and the load is balanced.
- **Basket Hitch:** A basket hitch is described by federal OSHA as a sling configuration whereby the sling is passed under the load and has both end attachments, eyes, or handles placed on the lifting hook or a single master link. This method provides the greatest lifting capacity: double that of a vertical (straight) sling hitch and about two and a half times that of a choker configuration. However, it’s important to ensure that the load is balanced by centering its weight within the basket, as an uneven weight distribution allows the load to tip to one side and become unstable.

When using two or more slings to lift a load, there is one primary factor that can alter the rated capacity of the slings, and that is the angle between the sling legs and the horizontal plane across the top of the load. All other things being equal, the flatter, or more severe, the sling angle, the lower the lifting capacity of the sling. Conversely, the greater or less severe the angle, the greater the capacity of the sling.

As demonstrated in the following examples, the angle effect is also important to remember when a sling is attached to a load using a basket hitch. The negative effect is most pronounced when using a short sling because doing so decreases the angle of the sling relative to the load, significantly lowering the sling’s lifting capacity. The angle effect also reduces sling capacity when using a choker hitch to lift a load.

HOW SLING LEG ANGLE AFFECTS LIFTING CAPACITY

In review, the angle at which a sling is positioned relative to the horizontal plane of a load can significantly affect its ultimate lifting capacity. It is important to follow instructions for proper rigging techniques as specified by a qualified person and the sling manufacturer’s data. This includes making sure the angle of the sling legs relative to the load is adequate so the load can be lifted safely.

- If you or the rigger have not been trained and do not understand the principles outlined above, you are not authorized to rig anything. If you suspect or have any concerns with the rigging of a load, you need to “stop work” and remove yourself to a safe area.

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“1926.1401 - Definitions. | Occupational Safety and Health Administration.” Osha.gov, 2023, www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.1401.

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OSHA Training Toolbox Talk: Material Handling and Storage -How Sling Angles Affect Capacity.

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